EDITORIAL

Evolving a Computer Facility

To a data-processing expert experienced in the use of computers for solution of a variety of nonbiomedical problems, the application of computers to medicine may at first seem to offer little challenge for research. Too many such individuals have approached this area as a problem requiring only the skillful application of existing computer techniques and ignored the possibility that the techniques, which worked quite well for other data processing applications, might prove completely inadequate for the biomedical problems. The real tragedy in such an event, however, is not due to the fact that the method borrowed from another application failed, but because the problem had not been approached as a research project in the first place—too much time was lost before the mistake in system design was recognized. In launching into any new biomedical computing application it is essential to provide tests at each step and sufficient flexibility so that changes in approach can readily be made in response to experience. This means, of course, a tight coupling between the design of the hardware and software on the one hand, and the use of the system in solving the medical problem on the other.

In many cases it is important to recognize that insufficient facts are available at the start of a study to justify more than a simple initial design effort oriented toward getting the project underway and gaining some direct experience with the application of computer methods to the biomedical problems at a particular institution. Even a little experience with such a trial effort will often provide sufficient data to plan much more intelligently for the next iteration than would have been possible from *a priori* knowledge alone.

To optimize the ease with which such an approach can be realized, it is desirable to start with (1) a computer system that provides easy access for the programmer—including on-line debugging capability, (2) a working relationship between programmer and biologist, which permits clear understanding by both parties of the other's problems, goals and priorities (ideally, the biomedical scientist should do at least part of the programming), (3) input and output facilities (including software), which would provide easy control by the programmer of sampling rates and sequences for analog data and graphic display of results, and (4) sufficient engineering talent *in house* that modifications and additions to the hardware can be made if and when they are required without the limitation that comes from dependence on one particular manufacturer.

Although these categories of personnel are not easy for any institution to acquire at the present time, it is important to realize that such talents are needed. In many cases a *bootstrap* operation will be required to evolve a computer facility optimally matched to the problem mix of a particular biomedical research environment.

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